SPIRIT AND REASON: THE VALUE OF NASA
Remarks by NASA Deputy Administrator Lori B. Garver
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Thank you Ken for that introduction and good afternoon to you all.

Nearly eight weeks ago I raised my right hand with Charlie Bolden and took an oath to help lead NASA during these turbulent and exciting times. Like our new administrator, this isn't the first time I've worked for NASA. While Charlie flew aboard the Space Shuttle, I served as Associate Administrator for Policy and Plans. I send Charlie's greetings, he really wanted to be here with you. We consider you all, the industry, academia and associations part of the NASA family. Charlie and I got to know each other during our Senate Confirmation preparation. While that is a difficult process, if you are going to have to go through it, I definitely recommend going through it with Charlie Bolden. For those of you who know him, you know he is an incredible leader and humanitarian. It is a privilege to work with him. Now, as part of this new leadership team, we begin to take on the challenges and opportunities that lie ahead. Part of our challenge is to utilize our unique mission and capabilities to address critical national needs and then to

communicate the importance of these missions to the public – making sure everyone knows what we are doing and why, and how space technology has become central to today's way of life. I see the benefits of America's investment in NASA in two specific areas – Spirit and Reason. Space exploration is one of our country's crown jewels. It is a jewel that lifts the Nation's and the world's spirit. In addition, NASA offers specific benefits, the "reason" of NASA's investment, in aeronautics, Earth science as well as in space technology that is embedded in nearly everything we need and use every day.

Exploration and discovery have values of their own as NASA has proven for over 50 years. My professional experience has been primarily in the area of human space flight and I truly believe in NASA's ability to inspire and lift the nation and the world in the future. Today NASA programs are revealing the world with details, depth and clarity that I find astonishing. Our opportunity is to focus our missions on providing this value and to better communicate that value in a way that shows our relevance to every American. I promise to give more speeches on the spirit – but you all know this, and it was hard to find something to talk about today that this group doesn't know. I do want to give you just one "spirit" story – since we all

have them. For the most recent Shuttle launch (the first since Charlie and I have been confirmed), a few of my friends came to the launch. These are my friends who have helped me through the years – driving the boys to and from football and piano practice. One of my friends sons, Conner, came to Florida and participated in the tours and listened to the astronauts. Conner is 15 and has not yet found his passion in school. Even though Conner did not see a launch, my friend has seen a new spark in him since this experience. Conner told me one night he was in Florida, "I don't see how anyone could see what I have seen these last few days and not support this program". He now is talking about trying to go to the Naval Academy (of course Charlie had something to do with that). We all have stories about people like Conner – we know that NASA does inspire.

Now many people have asked what we have seen since we have been back that is different from before… Today I want to highlight a couple of the really amazing innovative things NASA is doing that I believe must be a part of our future.

Providing public value could not be more important. Budgets were tight when I last served at NASA, but are even more so today. NASA's budget

must compete with many other valuable scientific programs and vital government services. To earn our trust from the taxpayers, we must help create a better future through programs that are aligned with both short and long term national interests. We then must better explain what we do – and show that value lies in all of our missions.

NASA needs to focus on addressing key national priorities that will help grow our economic base; by investing in innovation and technology and developing and sustaining commercial industries. In addition, NASA can and should contribute to the nation's education goals – especially the goal of doubling science and technology graduates by 2020. In helping to reach this goal, I believe we have the intersection of spirit and reason – the push is the inspiration to go into these fields. The pull is the meaningful work that is provided.

NASA has already changed from the agency I was part of in the 1990s, flying new missions and developing innovative technologies. Charlie and I have visited each NASA field center, and I have taken part in seven town hall meetings-much different, I'm glad to say, than the town halls on health care you have seen lately on television. Although while standing with

Charlie on a platform in the middle of the factory floor at Michoud I felt a bit like Norma Rae – all I needed was to replace my microphone with a bull horn – "to the stars!" We have listened to our fellow employees, and learned a lot about what NASA is doing today, across all of the agency's Mission Directorates. What I have learned has renewed my faith in NASA's abilities to provide increasing value to the nation we serve. Today, I want to share with you some of the stories I've heard and projects I've seen about things that NASA is doing that may surprise you as much as it did me.

Many of the benefits we get from our civil space program come from innovative technologies, technologies designed to reveal new scientific truths but which also enhance our understanding of the world we all live in.

As I speak, NASA has more than a dozen Earth science satellites and instruments orbiting the Earth that are studying our oceans, atmosphere, land, biosphere and cryosphere. Several more are planned in the near future. Satellite images like this one from NASA's Terra and Aqua satellites are used by the USDA Forest Service in monitoring U.S. wildfires. The actively burning areas are indicated by red outlines – and I know these are more than just red outlines to many here in this audience – they are your neighborhoods

and parklands and we wish you the best as you work to bring balance to the interface of nature and societal impacts.

But what if I told you there was a way for every researcher, water manager, city planner and farmer to fly alongside these NASA spacecraft – without ever having to leave their computer?

That is what the amazing Global Climate Change web site and its Eyes on Earth 3D feature can do. Think of it as a way to check Earth's vital signs.

A partnership of NASA's Jet Propulsion Laboratory and the California Institute of Technology right here in Pasadena, the Global Climate Change web site offers an astounding amount of information about our environment in a dynamic, interactive format. With the Climate Time Machine you can explore the sea level from space, track the arctic sea ice, carbon dioxide levels in the atmosphere, map global temperatures, and see the 10.5 million square miles of the ozone hole.

The Eyes on the Earth 3D feature displays a dozen of our satellites as they orbit, in real time and with actual data that is no more than three or four

hours old. You can see how the Earth's temperatures and climate have evolved, images of the California fires, track how the satellites' orbits overlap, switch your view to that of the satellite itself, where you can zoom in and fly along. You can compare each individual spacecraft to a car or a scientist, and there are blogs and even a game that measures the relationship between carbon dioxide and Earth's cities. You can create maps of the data that in some cases can be displayed in three dimensions.

Taking the pulse of our planet isn't just for scientists. It's something everyone can do—whenever you can turn on your computer. So using this NASA data, those who actually need this information can benefit from the government's investment in these spacecraft. The return to the taxpayer is in the utilization of the data and this is an innovative way to distribute critical scientific information – in my day we struggled with EOS Dis and data distribution. Now you can take our planet for a spin, without even leaving the ground!

One of my favorite innovative NASA technologies that promises enormous benefits is a project I learned about at Ames Research Center a couple of weeks ago. We are looking at a way to use algae to produce clean biofuels

for jet fuel. You might ask why is NASA involved in this research? What do we bring to the table that the Department of Energy and others do not? It is the unique NASA perspective of systems engineering combined with our ability to look at closed life cycle systems that is so crucial. Like every NASA project, this one has an acronym – it wouldn't be NASA without one, right? It's called OMEGA for Offshore Membrane Enclosure for Growing Algae. Growing algae for fuel is not a new idea, but growing freshwater algae in the ocean is. In the OMEGA project, plastic bags filled with sewage are dropped to float in the ocean.

Algae are placed in the sewage-filled bags that have material we developed originally for recycling astronaut's wastewater on long space missions. Inside the bags, the algae eat the sewage, and produce a fat-soluble oil molecule that can be used later for fuel. The bags let freshwater out but keep saltwater from coming in. Oxygen and fresh, cleaned water are released into the ocean. All that is needed for the process are water, sewage, solar energy and carbon dioxide. The plastic bags can last three years, and the end result, oil for fuel, fertilizer and fresh water are produced basically energy-free. Someday, millions of acres of these floating bags could

produce enough oil for aviation and other uses, 21 billion barrels a day, and help solve the planet's energy needs.

So you might say NASA's research into pond scum in innovative plastic bags just might save our planet. I so loved this project that I asked for one of these bags to show folks in Washington. The other day my assistant told me, "your scum bag is here…" I was trying to remember who my next appointment was with…

Another example of NASA innovation providing hope for our future comes from the Marshall Space Flight Center.

When disaster struck in the Dominican Republic last spring, officials knew just where to get help, thanks to a NASA project called SERVIR. In Spanish, SERVIR means "to serve" and NASA, in a partnership with the U.S. Agency for International Development (USAID), uses satellite imagery to zero in on locations where destruction has taken place, perhaps from a hurricane, earthquake, fire, or in the case of the Dominican Republic, a massive flood around Lake Enriquillo. Researchers combine satellite data with observations made on the ground and create a real-time map of the

crisis points. With a glance at the computer screen, officials know where the most severe damage had occurred and can best route help more quickly. Historical data in the NASA archives was also used to look and compare this flood with past flooding events. The Lake Enriquillo map was even published on the front page of the Dominican Republic's largest newspaper "Hoy"—providing critical information to the general public. The SERVIR project currently operates in Central America, East Africa, and soon, the Himalaya Mountain region. What can this NASA technology do? It can save lives in an emergency and it helps protect the environment.

Other partnerships are being forged with new communities as well. In 2007, NASA signed an agreement with the National Institutes of Health. The project will use that portion of the International Space Station that serves as a U.S. national laboratory to research human health affected by the absence of gravity. Cell repair, tissue regeneration, health monitoring technologies, and metabolism will all be studied, and the results shared with NIH scientists. By working together, NASA and NIH will be able to accelerate life sciences research that not only will help make space exploration safer for our astronauts, but will apply those lessons to Earth-bound medical technologies as well. The unique properties of micro-gravity could

accelerate FDA drug and vaccine testing and approval, which could save thousands of lives and billions of dollars.

Another innovative partnership was forged with industrial partners led by Oceaneering International, and included David Clark Company, Honeywell, Harris Corporation, United Space Alliance and Paragon Space Development Corporation. The product will be a new generation spacesuit, our first new spacesuit in more than three decades. These new suits will be highly reliable, operationally efficient, and above all simple to maintain.

Different versions of the suits will be worn by astronauts in low Earth orbit, and will be designed to go beyond – to the asteroids, the Moon, the moons of Mars and ultimately on the red Martian dust where future explorers can go inspect Spirit and Opportunity and replace the wheel on Spirit as they may still be doing their Energizer bunny thing on Mars (now that is what I call innovation). The innovations from the new spacesuit designs can be applied anywhere Americans fly in space – and NASA turned to Oceaneering because of their history of innovative designs in diving suits for exploring the deep oceans and use in energy exploration. This innovative partnership is recognizing that NASA can also "spin-in" technologies developed by the

private sector, or other agencies. Today's reality demands that we work collaboratively. From the depths of the sea to outer space – that takes new ways of thinking, and new industry partnerships that are emblematic of how NASA must change in the years ahead.

Knowing our planet's vital signs in real time, advanced technology that could produce green energy for transportation, merging space and ground data to help disaster victims, using the space station for medical research, and seeking new ways to keep astronauts safe no matter where they travel, all of these examples tell us how much NASA contributes to improving life on Earth – and in space. There are many more such examples, across all our Mission Directorates and in every NASA field center. But we as an agency must continue to evolve, continue to be open to new ideas and agile new partnerships, if we are to take advantage of our many skills and experience and put it all to use in this 21st Century America.

I know there are those who are skeptical that NASA can change in such a substantial way. For the skeptics among us, let me offer this. Back in 2001, just 8 years ago, I was involved in a project called "Astro-Mom" in which I planned to ride a Russian Soyuz capsule and booster to visit the space

station. I grew up literally hiding under my school desk from the Russians, and in 2001 I found myself in Moscow and Star City Russia training for a space flight. This is the place where Cosmonauts are made, and here I was, a civilian, a wife and mother with roots in Michigan walking the paths space explorers took every day for years. The first human in space, Yuri Gagarin, trained here. The first woman in space, Valentina Tereshkova, lived and trained here. In the evenings and between my sessions with the medical procedures and training, I often walked the streets, visited the space museums and displays, in astonishment not only at the thought that I was training for spaceflight with Cosmonauts—but that, as an American, I was even allowed to be here at all.

How did that come to be? The world had changed and NASA had changed along with it. In the 90's there was Shuttle-Mir and then International Space Station. People said that we could not invite the Russians as partners. I'm sure some of you remember those Congressional hearings. Everyone said that we can't change the ISS orbit, and that we can't make five minute launch windows. But NASA made it happen. The very space program that symbolized the Cold War, now symbolizes our peaceful partnership. The world – and NASA – has changed, in a profound way that no one could have

predicted. Without our noticing it, one age of space had ended—peacefully—and a new era had begun. The old ways—of the old age—just wouldn't do. Even during my training in 2001 and 2002, astronauts were not planning to launch on the Russian Soyuz vehicle ever. Our agreement was for contingency return only – even NASA could accept only so much.

Back then (only 8 years ago), the use of Soyuz flights for commercial tourism was yet another program that the old NASA had no interest in supporting when I left the agency in 2001. I wasn't allowed in NASA during my Astro-mom days and certainly not behind the glass doors as this program was so maligned.

Today Dave's and my son Wesley takes AP Russian in High School and the Russian Federation is a key partner providing transportation to and from the ISS. I'll be taking Wes along with me (at my expense) in a few weeks to welcome home NASA astronaut Mike Barratt. I will also be welcoming back Canadian private space explorer Guy Laliberté. NASA now embraces this program. So those of you who think NASA can't change, think about these dramatic shifts, for I have not just seen it but lived it in my own life.

It is a great privilege of my life to be able to now help NASA utilize its unique capabilities to address the many challenges in our evolving world. Through our incredibly talented workforce and contractors, we can again prove there is nothing we cannot accomplish. NASA rose to the challenge of the Cold War goal 40 years ago and the many, many challenges since. We will now rise to meet new challenges such as those that impact our environment, energy, health and economy. We will increase our investment in innovation and technology that will help create not only the industries of tomorrow, but this investment can help create the valuable jobs for a growing scientific and technical workforce and will continue to inspire the world.

Growing up in the late 1960's, I joined nearly all citizens as we looked up to NASA as the very best part of America. In fact, in many ways it is the ultimate expression of what it means to be American. We push boundaries and expand frontiers. We need children growing up today (like Conner) to understand this again: NASA is still the very best part of America and can reach great accomplishments. Future generations can be a part of those accomplishments and can be part of a better future. From the Earth to the Moon, planets and the stars, NASA will play a significant role in our

collective efforts to ensure the security of our Earth and to expand the frontiers of our presence. With your help, I know NASA will again rise to the challenge.

I'd like to again offer my thanks to the AIAA for this invitation to speak with you today. Thanks to the sponsors of this luncheon session, Lockheed Martin. Please continue to help NASA provide value and help spread the message of our incredible mission to the Nation – both the spirit and the reason.